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MEMOIRS
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*Figures and Descriptions*

ILLUSTRATIVE OF  
BRITISH ORGANIC REMAINS.

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DECADE IV.  
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BRITISH FOSSILS.

DECADE THE FOURTH.

ALL the plates and descriptions in this Decade are devoted to fossil Echinodermata of the order *Echinoidea*.

The genera selected for illustration are *Temnechinus*, *Acrosalenia*, *Hyboclypus*, *Hemipneustes*, *Ananchytes* with its section *Holaster*, and *Cardiaster*. The geological age of the first is Upper Tertiary, of the second and third Oolitic, of the remainder Cretaceous. Several of the species are represented for the first time.

Temnechinus is a genus remarkable for its species being at present known only as fossils of the Coralline and Red Crag; it is now characterized for the first time.

The examples of *Acrosalenia* selected are both remarkable for their beauty and their very perfect condition. They are also of much interest, one on account of the rectification of its true generic position, which I have been enabled to make through the aid afforded by very perfect specimens: the other, because of the complete preservation exhibited by the specimens described of parts too often lost in fossil Echinoderms. I have appended to the descriptions of these *Acrosalenia* brief characters of some new species of this interesting oolitic genus.

Hyboclypus is illustrated by the finest and largest species of the genus, one discovered during the researches of the Geological Surveyors.

Hemipneustes, to which genus I unite *Toxaster*, is now for the first time authentically represented by a British example, remarkable for its novelty and for the light it throws upon the mutual affinities of those genera of *Echinoidea* which have excentric mouths.

The well known genus *Ananchytes* is combined (as indeed it was formerly by Lamarek) with *Holaster*. In selecting the common *Ananchytes ovata* of the Chalk for the subject of a plate and description, I have been influenced by the necessity of clearing up the confused synonymy of this fine fossil, and of settling the numerous spurious species which have been constituted out of its varieties, or from imperfect figures contained in old works.

Cardiaster is a new genus, lately constituted by myself for some remarkable and interesting sea-urchins, intermediate in their characters between *Ananchytes* and the true *Spatangida*. To the account of the species figured I have added notices of all the forms of this curious type which are known to me as British.

EDWARD FORBES.

October, 1852.

BRITISH FOSSILS.

DECADE IV. PLATE VII.

ANANCHYTES (HOLASTER) SUBGLOBOSA.

[Genus ANANCHYTES. LAMARCK. (Sub-kingdom Radiata. Class Echinodermata. Order Echinoidea. Family Ananchytidæ.) Body orbicular, oblong, or obscurely cordate, tumid; with homogeneous ambulacra, convergent on the vertex, all plane, or with the anterior ambulacrum in a shallow furrow. No fascioles. Vent terminal, marginal or supra-marginal. Apical disk elongated, and composed of four perforated genital and five perforated ocular plates. Tubercles perforate, their bosses crenulate. Spines minute. No dental apparatus.

Sub-genus HOLASTER. Body cordate. Vent terminal and supra-marginal.]

DIAGNOSIS. *A. ambitu subcordato; testâ crassâ, tumidâ, lateribus rotundatis.*

FORMA *a. Normalis, tumida, cordata.*

FORMA *β. Expansa, depressa.*

ANANCHYTES SPATANGIFORMIS, ROEMER, Norddeutsch. Kreide Geb., p. 35, pl. 6, fig. 19.

FORMA *γ. Globosa, suborbicularis.*

FORMA *δ. Cordata, tumida, anticæ sulcata.*

SYNONYMS.—*Spatangus subglobosus*, LESKE ap. KLEIN, Nat. Disp. Echin., p. 240, pl. 54, f. 2, 3. (1778.) DEFRANCE, Dict. Sc. Nat., vol. i., p. 94. GOLDFUSS, Petrefacta Germanica, p. 148, pl. 45, f. 4. DESMOULINS, Tabl. Synopt., p. 398.

Echinus subglobosus, GMELIN.

Holaster subglobosus, AGASSIZ, Prod. in Mem. Soc. d'Hist. Nat. de Neuchâtel, p. 183. Echin. Suisses, pt. i, p. 13, pl. 2, fig. 7, 9. ROEMER, Norddeutsch. Kreide Geb., p. 34. REUSS, Boehm. Kr., p. 57. SIMONDA, Ech. Foss. Nissa., p. 5. AGASSIZ and DESOR, Cat. Raisonné des Echinides, Ann. des Sc. Nat., 3d ser., vol. viii. p. 27. DIXON, Geol. Sussex, p. 341, pl. 2, f. 2. and 1 and 2.

The figures given by Leske of this well-known Echinite were sufficiently characteristic to prevent the commission of many subsequent errors. Lamarck, however, applied the name to a tertiary fossil. Since his time palæontologists have been content to preserve Leske's name for this species.

The body varies in outline from broadly sub-cordate to sub-orbicular, and from depressed to spheroidal. The ambulacra are regularly radiate and linear lanceolate, the apices of the three anterior ones converging at some small distance from those of the two posterior ones, which meet at their tips very closely. The breadth between the avenues of pores is nearly equal in all, but the breadth of the double series of ambulacral plates is greater in the lateral ones than in the odd or anterior ambulacrum. Of the interambulacra, the hinder or odd one and the antero-laterals are narrower than the postero-laterals. In the uppermost portion of each ambulacrum the plates are broad and very short, and five of them go to the breadth of an interambulacral plate; but about half way down the sides they widen out, and near the turn of the base not more than two equal an interambulacral plate. In the dorsal portion of each lateral avenue the pores of each pair are set well apart and connected by a furrow, but below the middle and in the wider plates they become smaller and closer. There are about 30 or so of the wider pairs. In the odd ambulacrum they are nearly similar throughout. The total number of pairs of pores is between 35 and 50, the number in the odd ambulacrum being less than in the others. The surfaces of the dorsal and lateral plates of all the segments bear very minute equal primary tubercles scattered and intermingled with minute miliary granules on the under surface especially; on the ambulacral segments in the neighbourhood of the mouth the tubercles become larger. On the anterior portion of the broadly lanceolate ventral posterior interambulacral segment they are closely set and somewhat regularly arranged, but become more scattered on its hinder part. On the ventral ambulacral segments there are very few tubercles but closely set granules. All the tubercles are perforated and set upon bosses with crenulated summits. The sides are tumid and rounded in all the varieties; the cheeks rather swollen. There is a shallow depression in front of the mouth terminating the more or less marked anteaal sulcus. The mouth itself is transversely oblong; its upper lip is higher than the lower, and thickened. The buccal extremities of the avenues form an irregular and obscure star around it. The anal extremity of the test is obtusely truncate, and in the more cordate examples slightly hollowed out vertically beneath the vent. That orifice is placed at about or a little lower than half the height of the test. It is vertically elliptical. The apical disk is much elongated; it is composed of four perforated

genital plates, of which that combined with the rather conspicuous madreporiform body is largest, and of five perforated oculars, of which the two antero-laterals are much larger than the others; it is the size and contiguity of these plates that chiefly cause the elongation of the disk. The fifth or posterior genital plate is minute and imperforate. On the cast there are traces of the presence of an internal sand-canal. The test is remarkably thick in substance, especially beneath.

The following table of the comparative dimensions of six specimens selected on account of their differences will serve to illustrate the variation of proportions in this species.

No.	Locality.	Stratum.	Length.	Breadth.	Height.
1	Dover - -	Chalk Marl -	$2\frac{4}{12}$	$2\frac{5}{12}$	$1\frac{10}{12}$
2	„ - -	Lower Chalk -	2	2	$1\frac{3}{12}$
3	Chaldon -	Chloritic Marl -	$1\frac{11}{12}$	$1\frac{11}{12}$	$1\frac{4}{12}$
4	„ - -	„ „	$1\frac{11}{12}$	2	$1\frac{2}{12}$
5	„ - -	„ „	$1\frac{6}{12}$	$1\frac{5}{12}$	$1\frac{1}{12}$
6	„ - -	„ „	$1\frac{7}{12}$	$1\frac{6}{12}$	$1\frac{2}{12}$

Varieties. There is a curious variety of this species, apparently an abnormality, in which the anterior sulcus is impressed into a deep and almost acute furrow. I have found it at the junction of the Chalk Marl and Upper Greensand near Abinger in Surrey, and there is a very fine and large specimen of it in the British Museum.

Occasionally casts in Greensand are found extremely compressed. One of these appears to be the *Spatangus Murchisoni* of König, *Icones Sectiles*, f. 169. The figure of *Spatangus hemisphericus* of Phillips' *Geology of Yorkshire*, pt. i, pl. 1, fig. 15, bears a close resemblance to this species also, partially compressed. The "*Spatangus argillaceus*" from the Speeton Clay, of the same work, is evidently a *Holaster*, and possibly this species. In cabinets specimens of a *Hemiaster* from the Gault are often so labelled by mistake.

Locality and Geological Position. This urchin abounds in the bed of Chalk with green grains intervening between the Upper Greensand and Chalk Marl. It is found also plentifully in the

Chalk Marl itself, and more rarely in the Lower Chalk. It occurs in all the English counties where these beds are found. It has not been observed in Ireland.

EXPLANATION OF PLATE VII.

Figs. 1. 2. 3. and 4. Views of an example of the normal form. The specimen selected is from the chloritic marl of Dorsetshire.

Figs. 5. 6. 7. and 8. Outlines of different varieties from the chalk marl.

Fig. 9. The apical disk.

Fig. 10. Ambulacral and interambulacral plates from the upper portions of their segments.

Fig. 11. A tubercle and granules from the upper surface.

Fig. 12. A tubercle and granules from the lower surface.

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October, 1852.

